CLAIMS

What is claimed is:

1. An apparatus for applying compensation to samples received from an optical channel comprising

a first decision device generating a decision for a current sample based on a threshold;

a second decision device generating a decision for a previous sample based on the threshold;

a first combiner generating a direction of transition between the decisions for the current and previous samples from a decision difference;

a second combiner generating an error signal as a difference between the current sample and the decision for the current sample;

a third combiner generating a sample difference between the current and previous samples;

a multiplier combining a magnitude of correction with the direction of transition to generate a correction value, wherein the multiplier selects the magnitude of correction based on the sample difference, the error signal, and the decision difference; and

a fourth combiner applying the correction value to the current sample to apply compensation to the current sample.

2. The invention as recited in claim 1, further comprising a third decision device generating a hard decision for the current sample based on the compensated current sample.

3. The invention as recited in claim 1, wherein the threshold is set based on a set of rules, wherein each rule is based on an observation of sample level given one or more observed previous samples.

4. The invention as recited in claim 3, wherein, for each decision device, the threshold is set for each sample.

5. The invention as recited in claim 1, wherein the magnitude c of correction for the k^{th} sample y_k is given by:

$$c = \begin{cases} y_k, & \text{if } S < 0, |e| < T_1 \\ 1 - y_k, & \text{if } S > 0, |e| < T_1, |d| > T_2 \\ 0, & \text{Otherwise} \end{cases}$$

where S is the decision difference, e is the error signal, d is the sample difference, and T_1 and T_2 are constants based on a specific implementation.

6. The invention as recited in claim 1, wherein the compensation applied to the current sample accounts for differential group delay of a signal passing through a single mode fiber.

7. The invention as recited in claim 1, wherein the apparatus is embodied in an integrated circuit.

8. The invention as recited in claim 1, wherein the apparatus is implemented in a receiver of an optical communication terminal.

9. A method of applying compensation to samples received from an optical channel comprising the steps of:

(a) generating a decision for a current sample and a decision for a previous sample based on a threshold;

(b) generating a direction of transition between the decisions for the current and previous samples based on a decision difference;

(c) generating an error signal as a difference between the current sample and the decision for the current sample;

(d) generating a sample difference between the current and previous samples;

(e) selecting a magnitude of correction combined with the direction of transition based on the sample difference, the error signal, and the decision difference;

(f) forming a correction value from the magnitude of correction with the direction of transition; and

(g) combining the correction value with the current sample to apply compensation.

10. The invention as recited in claim 9, further comprising the step of generating a hard decision for the current sample based on the compensated current sample.

11. The invention as recited in claim 9, further comprising the step of setting the threshold based on a set of rules, wherein each rule is based on an observation of sample level given one or more observed previous samples.

12. The invention as recited in claim 11, wherein the threshold is set for each sample.

13. The invention as recited in claim 9, wherein, for step (f) the magnitude c of correction for the k^{th} sample y_k is given by:

$$c = \begin{cases} y_k, & \text{if } S < 0, |e| < T_1 \\ 1 - y_k, & \text{if } S > 0, |e| < T_1, |d| > T_2 \\ 0, & \text{Otherwise} \end{cases}$$

where S is the decision difference, e is the error signal, d is the sample difference, and T_1 and T_2 are constants based on a specific implementation.

14. The invention as recited in claim 9, wherein for step (g), the compensation applied to the current sample accounts for differential group delay of a signal passing through a single mode fiber.

15. The invention as recited in claim 9, wherein the method is embodied in a processor of an integrated circuit.

16. The invention as recited in claim 9, wherein the method is embodied in a receiver of an optical communication terminal.

17. A computer-readable medium having stored thereon a plurality of instructions, the plurality of instructions including instructions which, when executed by a processor, cause the processor to implement a method for applying compensation to samples received from an optical channel, the method comprising the steps of:

a) generating a decision for a current sample and a decision for a previous sample based on a threshold;

(a) generating a decision for a current sample and a decision for a previous sample based on a threshold;

(b) generating a direction of transition between the decisions for the current and previous samples based on a decision difference;

(c) generating an error signal as a difference between the current sample and the decision for the current sample;

(d) generating a sample difference between the current and previous samples;

(e) selecting a magnitude of correction combined with the direction of transition based on the sample difference, the error signal, and the decision difference;

(f) forming a correction value from the magnitude of correction with the direction of transition;

and

(g) combining the correction value with the current sample to apply compensation.